Trends in Use of Common Antihypertensive Drugs in Bangladesh: A Study on Rajshahi City

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Abstract

Hypertension is a growing public health concern in Bangladesh, particularly in urban settings, where lifestyle, dietary changes, and socioeconomic factors influence disease prevalence and management. This cross-sectional descriptive study investigates the trends in antihypertensive drug use, adherence patterns, side effects, and socioeconomic determinants among 50 hypertensive patients in Rajshahi City. Data were collected via structured questionnaires and analyzed using descriptive statistics and cross-tabulations. Findings reveal a predominance of ACE inhibitors (36%) and calcium channel blockers (30%), moderate medication adherence in 44% of patients, and common side effects such as dizziness and fatigue. Socioeconomic status subtly influences drug choice, with higher-income patients accessing combination therapy more readily, while lower-income patients rely on cost-effective options such as diuretics. The study addresses gaps in localized antihypertensive utilization data and emphasizes the need for patient education, subsidized medication programs, and community-based interventions. These insights can guide clinicians and policymakers in optimizing hypertension management and improving cardiovascular health outcomes in urban Bangladesh.

Keywords: *Hypertension; Antihypertensive drugs; Medication adherence; Socioeconomic factors; Rajshahi City, Bangladesh.*

INTRODUCTION

Hypertension is widely recognized as one of the most significant modifiable risk factors for cardiovascular disease (CVD), stroke, renal failure, and premature mortality globally (Okwori, *et al.*, 2026). According to the World Health Organization (WHO, 2023), approximately 1.28 billion adults worldwide live with hypertension, with a disproportionate burden in low- and middle-income countries (LMICs). Persistent elevated blood pressure contributes substantially to ischemic heart disease and cerebrovascular accidents, which remain leading causes of death worldwide (GBD 2019 Risk Factors Collaborators, 2020). The epidemiological transition in developing countries, including Bangladesh, has intensified the public health significance of hypertension due to demographic ageing, rapid urbanization, and lifestyle transformation (Deswal, *et al.*, 2025).

In Bangladesh, the prevalence of hypertension has increased markedly over the past two decades. National survey data suggest that nearly one in four adults suffers from elevated blood pressure, with higher prevalence in urban populations (Bangladesh Bureau of Statistics [BBS], 2019). Urbanization has introduced sedentary behaviors, dietary shifts toward high salt and processed foods, increased obesity rates, and psychological stress—all established determinants of hypertension (Islam, 2020). Furthermore, awareness, treatment, and control rates remain suboptimal, exacerbating the risk of cardiovascular complications.

Pharmacological management through antihypertensive drugs is central to hypertension control strategies. Current clinical guidelines recommend several major drug classes—including angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), calcium channel

blockers (CCBs), beta-blockers, and diuretics—either as monotherapy or combination therapy depending on patient risk profile (Whelton *et al.*, 2018; Parvin, *et al.*, 2026). However, real-world prescribing patterns often diverge from guideline recommendations due to cost constraints, physician preference, drug availability, and patient adherence behavior (Chowdhury, 2021). Variability in drug choice and adherence can significantly influence treatment outcomes. Therefore, examining trends in antihypertensive drug utilization within specific urban contexts in Bangladesh is critical for understanding how clinical recommendations translate into practice.

Objectives

- To assess the demographic profile of hypertensive patients in Rajshahi.
- To identify commonly used antihypertensive drug classes.
- To examine patterns of drug adherence and side effects.
- To analyze the influence of socioeconomic status on antihypertensive drug selection.

LITERATURE REVIEW

Hypertension is one of the most prominent non-communicable diseases (NCDs) globally and a leading modifiable risk factor for cardiovascular disease (CVD), stroke, and chronic kidney disease. The World Health Organization (WHO, 2023) estimates that approximately 1.28 billion adults worldwide live with hypertension, with nearly 67% residing in low- and middle-income countries (LMICs). The Global Burden of Disease study identifies elevated systolic blood pressure as a top contributor to disability-adjusted life years (DALYs), particularly in South Asia (GBD 2019 Risk Factors Collaborators, 2020). These findings underscore the pressing need for effective pharmacological and public health interventions.

In Bangladesh, hypertension prevalence has increased substantially over the past two decades, reflecting rapid urbanization, dietary transition, reduced physical activity, and increased life expectancy. National surveys indicate that nearly one-quarter of adults are hypertensive, with higher prevalence observed in urban areas (Bangladesh Bureau of Statistics [BBS], 2019; Chowdhury, 2021). Despite rising awareness, treatment and control rates remain inadequate. Chowdhury (2021) report that a significant proportion of hypertensive individuals are either untreated or inadequately controlled, highlighting gaps in both healthcare access and long-term management strategies.

Pharmacological treatment remains central to hypertension control. Evidence-based guidelines, including the ACC/AHA recommendations, advocate for the use of ACE inhibitors, angiotensin receptor blockers (ARBs), calcium channel blockers (CCBs), and thiazide diuretics as first-line therapies (Whelton *et al.*, 2018). However, real-world prescribing patterns often diverge from guideline recommendations due to cost, drug availability, physician preference, and patient-level factors (Khatib *et al.*, 2014). In LMIC contexts, affordability plays a critical role in medication selection, with lower-income populations often relying on less expensive options such as diuretics.

Regional studies from South Asia reveal variability in antihypertensive prescribing trends. Research from India and Pakistan suggests that CCBs and beta-blockers are frequently prescribed, reflecting both physician familiarity and economic considerations (Gupta *et al.*, 2019). In Bangladesh, hospital-based prescription audits indicate that ACE inhibitors and CCBs are commonly used, though diuretics remain prevalent among economically disadvantaged groups (Rahman *et al.*, 2018a). These patterns suggest a socioeconomic gradient in drug utilization, potentially influencing long-term cardiovascular outcomes.

Medication adherence is another critical dimension influencing treatment effectiveness. Globally, adherence to antihypertensive therapy averages between 50% and 70%, with lower adherence observed in LMIC settings (Burnier and Egan, 2019). Barriers include medication cost, side effects, inadequate patient counseling, low health literacy, and complex treatment regimens (Abegaz *et al.*, 2017). In Bangladesh, adherence challenges have been associated with financial constraints and insufficient follow-up mechanisms (Islam, 2020). Poor adherence not only undermines blood pressure control but also increases the risk of cardiovascular complications and healthcare costs.

Literature Gaps

Despite growing research on hypertension prevalence and general treatment patterns in Bangladesh, several important gaps remain. First, most existing studies are nationally aggregated or hospital-based, limiting understanding of localized urban prescribing trends in secondary cities such as Rajshahi. Urban health dynamics vary across cities due to differences in healthcare infrastructure, socioeconomic composition, and access to private versus public services. Therefore, extrapolating national data may obscure important local variations.

Second, prior research has largely focused on prevalence, awareness, and control rates rather than detailed analyses of drug class utilization patterns and their socioeconomic determinants. There is limited empirical evidence examining how income, occupation, or education influence antihypertensive drug selection in urban Bangladeshi populations.

Third, the interaction between drug utilization patterns, adherence levels, and reported side effects remains underexplored in the Bangladeshi context. Understanding whether specific drug classes are associated with lower adherence or higher adverse-effect reporting could inform rational prescribing practices.

Finally, there is insufficient evidence assessing the alignment between international guideline recommendations and real-world prescribing behaviors in Bangladesh. Evaluating this alignment is essential for identifying policy and clinical practice gaps.

Addressing these literature gaps through a focused study in Rajshahi City contributes to a more nuanced understanding

of antihypertensive drug utilization trends and supports data-driven strategies for improving hypertension management in urban Bangladesh.

RATIONALE

While national-level data provide estimates of hypertension prevalence and general treatment coverage, there remains limited evidence regarding localized patterns of antihypertensive drug utilization in mid-sized urban centers of Bangladesh. Drug utilization studies are essential for evaluating rational prescribing practices, identifying inequities in access, and assessing whether therapeutic choices align with evidence-based guidelines (WHO, 2012). Without such context-specific analyses, health policy decisions may overlook variations shaped by socioeconomic and infrastructural realities.

Rajshahi City offers a strategically relevant setting for analyzing trends in antihypertensive drug use. As a growing urban center in northwestern Bangladesh, Rajshahi reflects demographic transition, expanding healthcare infrastructure, and diverse socioeconomic strata. Access to both public hospitals and private clinics creates variability in prescribing environments, while income differences may influence patients' capacity to afford certain drug classes, particularly newer or combination therapies. Studies in similar LMIC contexts suggest that economic status significantly affects medication adherence and drug selection, often leading to reliance on lower-cost medications such as diuretics (Khatib *et al.*, 2014).

Understanding these localized prescribing and utilization patterns is essential for several reasons. First, it enables evaluation of whether first-line antihypertensive therapies recommended by international and national guidelines are being adopted in routine clinical practice. Second, it helps identify adherence gaps that may undermine blood pressure control and increase long-term cardiovascular risk. Third, it provides evidence to inform targeted interventions—such as subsidy programs, patient education campaigns, and physician training initiatives—aimed at improving rational drug use.

Therefore, investigating trends in antihypertensive drug use in Rajshahi City not only contributes to academic knowledge but also supports data-driven policymaking to strengthen urban hypertension management in Bangladesh.

MATERIALS AND METHODS

Study Design and Population

This cross-sectional descriptive study was conducted in Rajshahi City from March to May 2025. 50 diagnosed hypertensive patients, aged 30–70 years, were sampled using convenience sampling from outpatient clinics. This design is appropriate for estimating prevalence and identifying associations in health service research without requiring long-term follow-up (Setia, 2016; Levin, 2006). Conducting the study in outpatient clinics ensured access to actively treated hypertensive patients, reflecting real-world prescribing practices. Convenience sampling was used due to feasibility and resource constraints, a common approach in exploratory utilization studies (Etikan *et al.*, 2016).

Data Collection

Data was collected via structured questionnaires, including:

- Demographics (age, gender, occupation, education)
- Details of antihypertensive drug use
- Duration of therapy
- Medication adherence
- Side effects
- Lifestyle factors (diet, exercise)

Structured questionnaires were selected to ensure systematic, uniform, and quantifiable data collection across participants. This method enhances reliability by standardizing questions related to demographics, antihypertensive drug use, therapy duration, adherence, and side effects (Bowling, 2014). Questionnaires are particularly suitable for cross-sectional studies examining behavioral and treatment patterns, as they allow efficient data capture within limited time and resource settings (Setia, 2016). Including lifestyle variables such as diet and exercise enables assessment of confounding influences on hypertension management. Self-reported adherence measures are widely used in clinical research to evaluate real-world medication-taking behavior (Nguyen *et al.*, 2014), supporting comprehensive analysis of utilization trends.

Data Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Frequencies, percentages, and cross-tabulations were used. Trends were visualized using charts (described in text). Descriptive statistics were employed to summarize antihypertensive drug utilization patterns efficiently and transparently. Frequencies, percentages, and cross-tabulations are appropriate for cross-sectional studies examining distributional trends rather than causal inference (Setia, 2016). Microsoft Excel facilitates systematic data organization and visualization, while charts enhance interpretability of patterns and comparisons (Kirkwood and Sterne, 2003).

Table 1: Demographic Profile of Respondents (n=50).

Variable	Category	Frequency	Percentage (%)
Gender	Male	28	56.0
	Female	22	44.0
Age Group	30–39	8	16.0
	40–49	16	32.0
	50–59	14	28.0
	60+	12	24.0
Education	No formal	4	8.0
	Primary	14	28.0
	Secondary	18	36.0
	Higher	14	28.0
Occupation	Service	20	40.0
	Business	12	24.0
	Housewife	10	20.0
	Others	8	16.0

RESULTS

Demographic Characteristics

Table 1 summarizes participant demographics.

Interpretation: The demographic profile of respondents highlights key socio-economic and age-related patterns relevant to antihypertensive drug use. The slight male predominance (56%) may reflect healthcare-seeking behaviors or gendered access to medical services. The largest age group, 40–49 years (32%), aligns with the mid-life onset of hypertension, indicating early intervention needs. Educational attainment shows that the majority have secondary or higher education (64%), suggesting reasonable health literacy that could influence medication adherence. Occupational distribution, with service holders leading (40%), points to urban, sedentary lifestyle risks contributing to hypertension prevalence, consistent with global urban health trends.

Prevalence of Antihypertensive Drug Use

Respondents reported using the following major antihypertensive drug classes, as tabulated in Table 2.

Table 2: Antihypertensive drug classes used.

Drug Class	Frequency	Percentage (%)
ACE Inhibitors	18	36.0
Calcium Channel Blockers (CCBs)	15	30.0
Beta-Blockers	7	14.0
Diuretics	6	12.0
Combination Therapy	4	8.0

Interpretation: The analysis of antihypertensive drug use among hypertensive patients in Rajshahi City demonstrates a pronounced preference for ACE inhibitors (36%) and calcium channel blockers (CCBs, 30%), aligning with international and national clinical guidelines that recommend these classes as first-line therapies for effective blood pressure control and cardiovascular risk reduction (Whelton *et al.*, 2018; Chobanian *et al.*, 2003). Beta-blockers (14%) and diuretics (12%) were less frequently prescribed, likely due to concerns regarding side effects, comorbidities, or physician prescribing habits. Notably, combination therapy was minimally used (8%), which may reflect socioeconomic constraints, limited patient access, or prescriber caution toward polypharmacy (Alam *et al.*, 2019). These findings are consistent with similar studies in urban Bangladesh, where ACE inhibitors and CCBs dominate antihypertensive therapy, while combination regimens remain infrequent, especially among lower-income populations (Rahman *et al.*, 2020 a). The results highlight the interplay between clinical guidelines, patient characteristics, and socioeconomic factors in shaping prescribing practices in the region.

Patterns by Age and Drug Class

The pattern of drug use by age group is tabulated in Table 3.

Interpretation: ACE inhibitors remain popular across all age groups. CCB use increases with age, while combination therapy remains stable. The age-stratified analysis of antihypertensive drug use in Rajshahi City reveals distinct prescribing patterns aligned with both clinical guidelines and patient demographics. ACE inhibitors are consistently preferred across all age groups, suggesting their established efficacy and tolerability for managing hypertension (Whelton *et al.*, 2018). Calcium channel blockers (CCBs) show increased utilization among older adults, particularly those over 50, likely due to their effectiveness in isolated systolic hypertension, which is more prevalent with advancing age (Chobanian *et al.*, 2003). Beta-blockers and diuretics exhibit relatively stable but lower usage across age categories, potentially reflecting prescriber caution due to side effects or comorbid conditions. Combination therapy remains consistently low (8–12%), possibly due to cost constraints or the absence of severe or resistant hypertension in this sample. These trends are consistent with studies from urban Bangladesh and South Asia, where ACE inhibitors and CCBs dominate treatment regimens, while polytherapy is reserved for complex cases (Rahman *et al.*, 2020 a; Alam *et al.*, 2019).

Medication Adherence

Adherence was evaluated using a self-reported scale.

Table 4: Medication adherence.

Adherence Level	Frequency	Percentage (%)
Good	18	36.0
Moderate	22	44.0
Poor	10	20.0

Interpretation: The analysis of medication adherence among hypertensive patients in Rajshahi City reveals that moderate adherence (44%) was most prevalent, followed by good adherence (36%) and poor adherence (20%) (Table 4). This suggests that a substantial proportion of patients face challenges in consistently following prescribed regimens. Factors influencing adherence may include forgetfulness, side effects, complex dosing schedules, financial constraints, or limited health literacy (Vrijens *et al.*, 2012). Similar studies in urban Bangladesh report comparable findings, with moderate adherence ranging between 40–50% among hypertensive patients, highlighting persistent barriers in medication management (Alam *et al.*, 2019). These patterns underscore the need for patient-centered interventions, such as counselling, simplified drug regimens, and digital reminders, to improve adherence and optimize blood pressure control.

Table 3: Drug use by age group.

Age Group	ACE Inhibitors	CCBs	Beta-Blockers	Diuretics	Combo	Total
30–39	3	2	1	1	1	8
40–49	7	4	2	2	1	16
50–59	5	5	2	1	1	14
60+	3	4	2	2	1	12

Table 5: Reported side effects.

Side Effect	Frequency	Percentage (%)
Dizziness	14	28.0
Fatigue	10	20.0
Cough (ACE Inhibitor-linked)	6	12.0
Muscle Cramps	4	8.0
No Side Effects	16	32.0

Side Effects Experienced

The reported side effects by the patients are tabulated in Table 5.

Interpretation: The reported side effects among hypertensive patients in Rajshahi City indicate that dizziness (28%) and fatigue (20%) were the most prevalent, followed by cough (12%)—commonly associated with ACE inhibitors—and muscle cramps (8%). Notably, about one-third of patients (32%) experienced no side effects, suggesting tolerability in a substantial portion of the cohort. These findings align with similar studies in Bangladesh and South Asia, where dizziness, fatigue, and ACE inhibitor-induced cough are consistently reported as common adverse effects, influencing patient adherence and quality of life (Rahman *et al.*, 2020b; Hossain *et al.*, 2018). Such side effect profiles underscore the need for clinicians to carefully monitor patients, provide guidance on managing adverse effects, and consider drug substitution or combination therapies to enhance treatment satisfaction and adherence.

Socioeconomic Factors and Drug Choice

Patients were grouped by income level (Table 6) to study the socio-economic factors and drug choice.

Interpretation: Higher income participants showed slightly more diverse drug use, including combination therapy. Diuretics were more common in lower-income patients due to lower cost and availability. The distribution of antihypertensive drug use across income levels reveals a clear socioeconomic influence on prescribing patterns and access. Patients with higher monthly incomes (>30,000 BDT) demonstrated more diverse drug utilization, including greater use of combination therapy, ACE inhibitors, and CCBs, reflecting better affordability and access to broader treatment options (Table 6). In contrast, lower-income patients (<15,000 BDT) predominantly used diuretics and single-drug therapies, likely due to cost constraints and availability, consistent with findings from similar urban studies in Bangladesh (Hossain *et al.*, 2019). The middle-income group (15,000–30,000 BDT) showed intermediate patterns, adopting slightly more varied regimens. These results suggest that economic capacity shapes drug choice, potentially affecting therapeutic outcomes and highlighting the need for subsidized or equitable access strategies to ensure optimal hypertension management across income strata.

DISCUSSION

Key Findings

The present study highlights significant trends in hypertension management among patients in Rajshahi City. Firstly, the demographic analysis indicates that hypertension affects both genders, with the highest prevalence among individuals aged 40–59 years. This aligns with prior research in urban Bangladesh, where middle-aged adults exhibited the greatest burden of elevated blood pressure, likely due to lifestyle factors, occupational stress, and dietary habits (Rahman *et al.*, 2018b).

In terms of pharmacological management, ACE inhibitors and calcium channel blockers (CCBs) emerged as the most commonly prescribed antihypertensive classes. This finding is consistent with global and regional guidelines emphasizing these drugs as first-line therapy for their efficacy in blood pressure control and cardiovascular risk reduction (Chowdhury *et al.*, 2020; Hossain *et al.*, 2019). The relatively lower use of beta-blockers, diuretics, and combination therapy may reflect prescribers' caution regarding side effects, cost considerations, and patient-specific comorbidities.

Medication adherence remains a critical challenge, with approximately 64% of patients exhibiting moderate or poor adherence. Similar adherence patterns have been observed in other urban studies in Bangladesh, where forgetfulness, financial limitations, and lack of patient education were major barriers to consistent therapy (Islam *et al.*, 2021). Poor adherence can directly undermine treatment efficacy and increase the risk of cardiovascular complications.

Side effects such as dizziness, fatigue, and ACE inhibitor-induced cough were frequently reported, potentially contributing to non-adherence and therapy modification. Comparable studies indicate that adverse effects are a significant determinant of discontinuation or switching of antihypertensive agents (Rahman *et al.*, 2018b).

Finally, socioeconomic status subtly influenced drug selection. Higher-income patients were more likely to use ACE inhibitors, CCBs, or combination therapy, whereas lower-income individuals relied on diuretics due to affordability and accessibility constraints. This echoes findings by Hossain *et al.* (2019), emphasizing that economic factors shape not only access but also treatment quality in hypertensive care.

Overall, these findings highlight the interplay of demographic, clinical, and socioeconomic factors in shaping hypertension management in Rajshahi City, underscoring the

Table 6: Income level vs. drug type.

Income Level	ACE Inhibitors	CCBs	Beta-Blockers	Diuretics	Combo
<15,000 BDT/mo	4	2	2	3	0
15,000–30,000	7	6	3	2	2
>30,000	7	7	2	1	2

need for targeted interventions to improve adherence, equity, and patient-centered care.

Implications

The findings of this study have multifaceted implications for both clinical practice and public health policy. Understanding demographic, socioeconomic, and adherence-related trends in antihypertensive use allows stakeholders to develop targeted interventions. Emphasizing patient-centered strategies, improving access to essential medications, and integrating behavioral and lifestyle modification programs are crucial. Additionally, insights into side effect prevalence and socioeconomic disparities highlight the need for adaptive treatment regimens and equitable healthcare delivery. Overall, translating these findings into actionable strategies can enhance hypertension management, reduce cardiovascular risks, and improve health outcomes across urban populations in Bangladesh.

Clinical Practice

From a clinical perspective, physicians play a pivotal role in improving hypertension outcomes. This study underscores the importance of patient education on medication adherence, strategies to manage common side effects, and the integration of lifestyle modifications alongside pharmacotherapy. Tailoring antihypertensive therapy based on age, comorbidities, and patient preferences can optimize efficacy and minimize adverse effects. Regular follow-up and counseling sessions can reinforce adherence and encourage behavioral changes, such as diet modification, physical activity, and stress management. Similar studies indicate that clinician-led education significantly improves adherence and reduces complications in hypertensive patients (Islam *et al.*, 2021; Rahman *et al.*, 2018a).

Public Health Policy

At the policy level, findings suggest a need for targeted interventions to improve hypertension management in urban Bangladesh. Governments and NGOs could subsidize essential antihypertensive medications, particularly for low-income populations, to reduce cost-related barriers. Public awareness campaigns should emphasize adherence, side effect management, and lifestyle changes. Integrating hypertension screening, counselling, and education into community health programs can enhance early detection and treatment. Additionally, policies promoting equitable access to healthcare services and monitoring drug utilization trends can help mitigate disparities and improve overall cardiovascular health outcomes (Chowdhury *et al.*, 2020; Hossain *et al.*, 2019).

Limitations

This study has notable limitations that affect generalizability and interpretation. First, the small sample size (n=50) restricts the applicability of findings to the broader urban hypertensive population. Second, the cross-sectional design captures a single time point, preventing causal inferences between demographic or socioeconomic factors and drug use patterns. Third, reliance on self-reported data introduces recall bias, potentially affecting accuracy in medication adherence and side effect reporting. Future studies could employ larger, longitudinal cohorts with objective measures to validate findings and provide more robust evidence for clinical and policy decision-making in hypertension management.

CONCLUSION

The study reveals notable trends in antihypertensive use in Rajshahi City: ACE inhibitors and CCBs are predominant, adherence remains moderately low, and socioeconomic factors influence drug patterns. The findings reveal a predominance of ACE inhibitors and calcium channel blockers, moderate adherence levels, and common side effects such as dizziness and fatigue. Socioeconomic status influences drug selection, with higher-income patients accessing combination therapy more readily, while low-income groups rely on cost-effective diuretics. These results align with global patterns reported in similar urban settings (Rahman *et al.*, 2018b; Islam *et al.*, 2021), while highlighting unique local dynamics related to income, lifestyle, and health awareness.

By focusing on demographic, adherence, and socioeconomic factors, this research addresses gaps in localized antihypertensive utilization data in Bangladesh, previously underrepresented in literature. It underscores the critical interplay between patient behavior, clinical decisions, and accessibility, fulfilling part of the evidence gap on urban medication trends and adherence barriers.

Future research should expand sample size, include longitudinal follow-ups, and incorporate objective adherence measures to better assess causal relationships. Policymakers and clinicians can use these insights to design patient-centered interventions, subsidized drug programs, and community-based education, ultimately improving hypertension control and reducing cardiovascular risk in urban Bangladeshi populations.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/ or falsification, double publication and/or submission, and redundancy has been completely observed by the authors.

Life Science Reporting

No life science threat was practised in this research.

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